



## Measuring “pHacts” About Acid Rain

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<b>Curriculum Area</b>	Mathematics
<b>Subject Area</b>	Graphing/Data Analysis
<b>Grade Level</b>	6 <sup>th</sup> grade
<b>Learning Objectives</b>	<ul style="list-style-type: none"> <li>• The student will gather data and exchange data with other students over the Internet.</li> <li>• The student will create an appropriate spreadsheet and enter their collected data.</li> <li>• The student will determine mean, median and mode for their data and explain what this means.</li> <li>• The student will choose a graph format in which to illustrate their collected data and then interpret that graph.</li> <li>• The student will write a report on their experiment, explaining their interpretations and the mathematical principles involved.</li> </ul>
<b>Correlation to the SOL</b>	Math 6.6, 6.18, 6.19 Science 6.11 C/T 8.1, 8.2, 8.4
<b>Video/Technology Hardware/Software Needed</b>	<p><b>For class:</b> Computer with Internet connection Computer Projection System Spreadsheet software (such as <i>Microsoft Works</i> or <i>ClarisWorks</i>) Word Processing software (such as <i>Microsoft Works</i> or <i>ClarisWorks</i>) E-mail software (such as <i>Internet Explorer</i> or <i>Netscape Communicator</i>)</p> <p><b>Web Sites:</b> <i>Acid Rain Project</i> <a href="http://www.angelfire.com/nj2/phacidrain/">http://www.angelfire.com/nj2/phacidrain/</a> <i>PH Testing Lesson Plan</i> <a href="http://www.angelfire.com/nj2/phacidrain/acidlab.html">http://www.angelfire.com/nj2/phacidrain/acidlab.html</a> <i>EPA Acid Rain Site</i> <a href="http://www.epa.gov/airmarkets/acidrain/">http://www.epa.gov/airmarkets/acidrain/</a> <i>EPA Acid Rain Experiments (see especially Experiment #4)</i> <a href="http://www.epa.gov/airmarkets/acidrain/experiments/index.html#observ.html">http://www.epa.gov/airmarkets/acidrain/experiments/index.html#observ.html</a></p>

<b>Materials Required</b>	<p><b>For class:</b></p> <p>Containers such as glass jars</p> <p>Various household substances to effect the acidity of water (see step 3 below for ideas)</p> <p>Enough plastic containers to collect samples of rainwater (see step 4 for ideas)</p> <p>pH paper strips, pH meter, OR pH probe and probeware</p>
<b>Procedures/Activities</b>	<ol style="list-style-type: none"> <li>1. Before starting this project the teacher needs to contact other classrooms with which to exchange information through the Internet. The teacher can exchange information with other classes locally, throughout the state or nationally. The teacher can also elect to participate in a project already created, such as the <i>Acid Rain Project</i> Web site.</li> <li>2. The students will gather data over a period of weeks or months. This will take very little class time until the end of the project when the data will be analyzed. You can also work cooperatively with a science teacher, who can supervise the collection of data while you supervise the analysis.</li> <li>3. Before starting this project you may wish to demonstrate how to measure pH using your measuring tool (pH paper, probe, or meter). You might bring in several substances to mix in water, such as baking soda, vinegar, lemon juice, etc. in order to show how the different substances effect water acidity. See the <i>PH Testing Lesson Plan Web</i> site for ideas.</li> <li>4. Explain to the students that they will be collecting some data and analyzing it mathematically. You can share with them information from the <i>EPA Acid Rain</i> Web site, or you can have the students explore this on their own. You can collect data in several ways: a) have students place three plastic containers around the school site; b) have students take home plastic cups (if your students are geographically dispersed); c) have students gather rain from streams, lakes, rivers, and other bodies of water in their area. All participants in the project should use the same method, however.</li> <li>5. Lead students through a discussion of what their spreadsheet for collecting data should include. Some thoughts: date, site location, pH reading. Work with the students to create a good spreadsheet, using the computer projection system. Send this spreadsheet to your partners through the Internet.</li> <li>6. Have students gather data after each rainfall over the period of time chosen (6 weeks to 3 months). Have them enter data into their spreadsheet and send information to their Internet partners through e-mail. As they receive information from their partners, have them integrate the data into their own class spreadsheet. This will be done sporadically throughout this time period.</li> <li>7. At the end of the data-gathering period, have students double-check the entered data. Have them determine the mean, median and mode of their data and determine whether or not this gives them insights into their data.</li> <li>8. Have the students figure out what type of graph they need in order to review and analyze their data. You may wish to go over the pros and cons of various types of graphs.</li> <li>9. Create their graph. Lead them through some conclusions about acid rain in their area and in other areas.</li> <li>10. Students should individually write one-page reports summarizing their experiment, data collection methods, use of the spreadsheet, graph and conclusions based on the data collected.</li> <li>11. Reports should be exchanged with other participating classes. For this purpose the students may work together to create one group report.</li> </ol>
<b>Content Assessment</b>	<p>The teacher could provide some “data” on another topic and have students work in small groups to create an appropriate spreadsheet and graph, as well as determine the mean, median and mode of the data.</p>
<b>Technology Integration</b>	<p>The reports written by the students should be evaluated for accuracy and depth, and kept in their portfolios.</p>

<b>Assessment</b>	
<b>Extensions</b>	<p><b>Science:</b> Have students explore the effects of acid rain on the environment, using one of the Web sites listed as a helpful resource.</p> <p><b>Geography:</b> Have students explore the various areas of the state or country from which their partners sent data. Discuss the various local industries and land uses that might effect the results.</p>